

Second week of development (bilaminar disc formation)

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- ▶ 2nd week , every things will be 2.
- ▶ Week of TWOs .

- ▶ N.B :
- ▶ Embryos of the same fertilization age do not necessarily develop at the same rate.

Major events:

1. Implantation.
2. Trophoblast becomes:
 - a. cytotrophoblast
 - b. syncytiotrophoblast
3. Embryoblast becomes:
 - a. Epiblast
 - b. Hypoblast
4. Formation of 2 cavities
 - a. Amnion
 - b. Yolk sac

1. Implantation:

A. Definition :

B. Common site :

C. Steps :

D. Abnormalities :

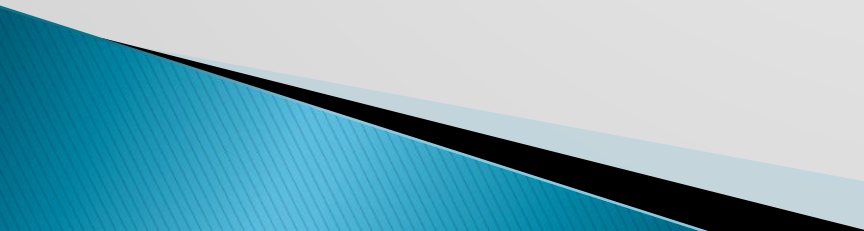
A. Definition :

Embedding of the blastocyst into the endometrium .

B. Common site:

Posterior wall of the upper part of the body of the uterus.

C. steps :

1. syncytiotrophoblast erodes the endometrium (makes a defect).
 2. the blastocyst is embedded first partially , deeply then completely.
 3. the defect area closed by blood coagulum first then by fibrin .
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Implantation – embedding of blastocyst into uterine lining begins at day 7

Blastocyst - with blastocoele cavity
Trophoblast - outer layer of cells
Inner cell mass - will form embryo

Trophoblast forms syncytial trophoblast - erodes into endometrium
Cellular trophoblast - carries nutrients to inner cell mass

Lacunae and primary villi formed by trophoblast
All of these form placental tissues

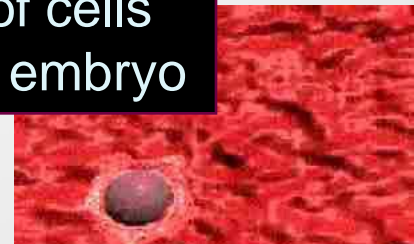
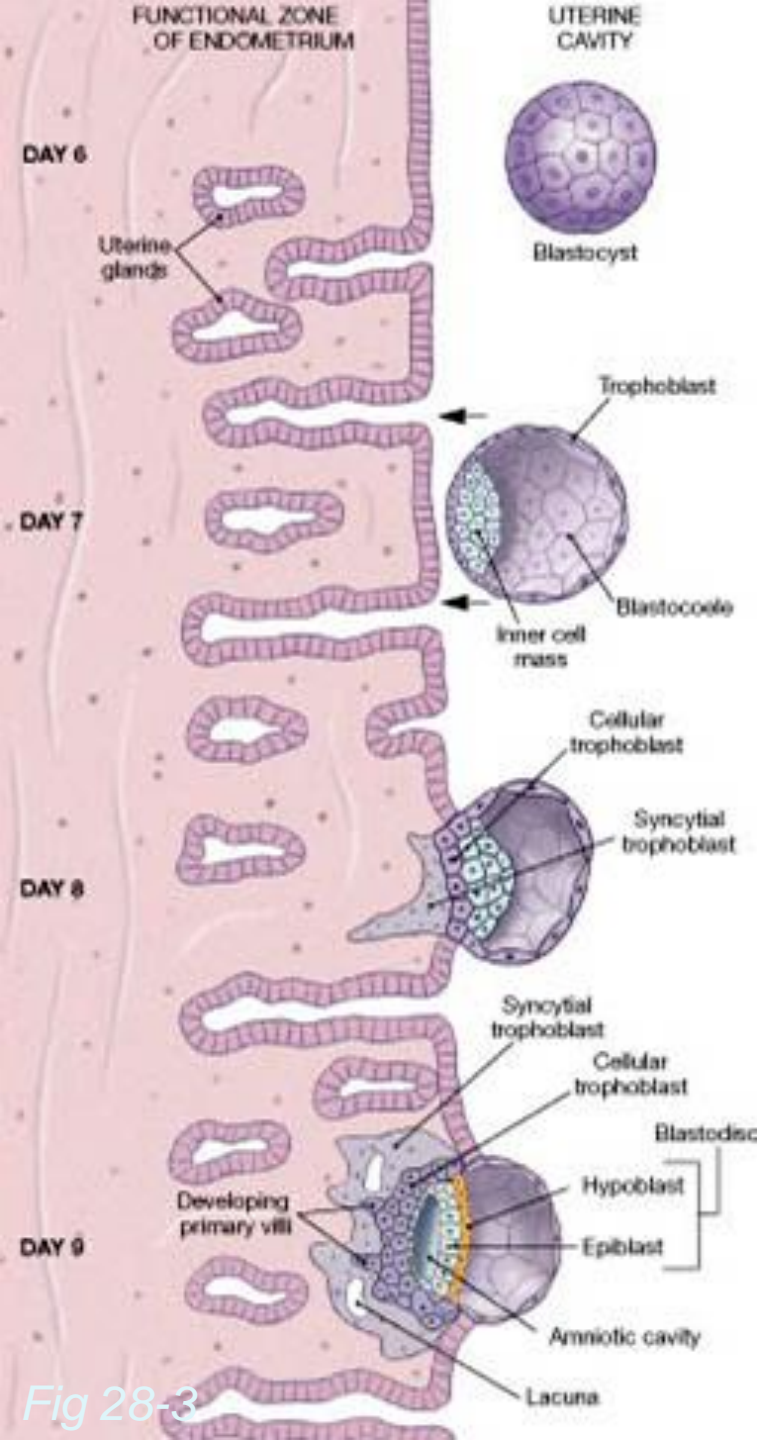
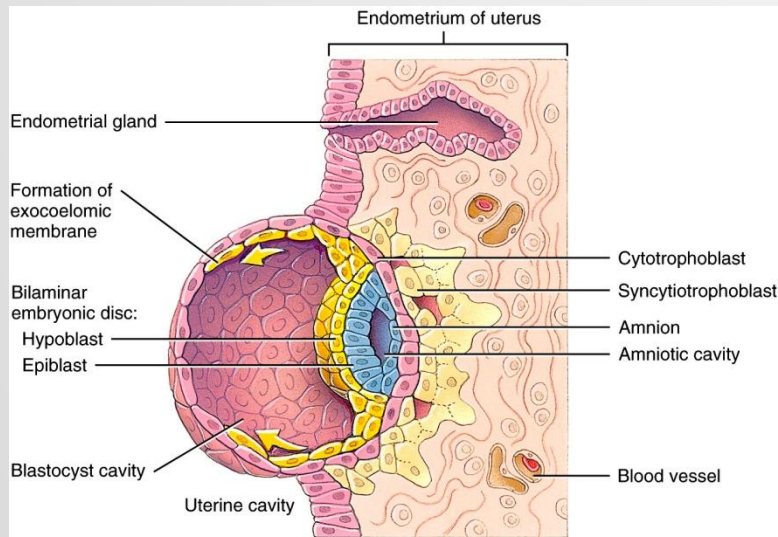


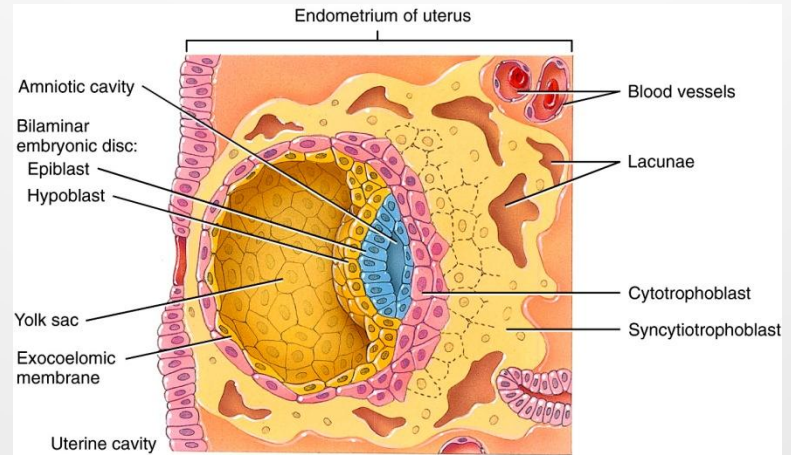
Fig 28-3

Principal events in the second week of development



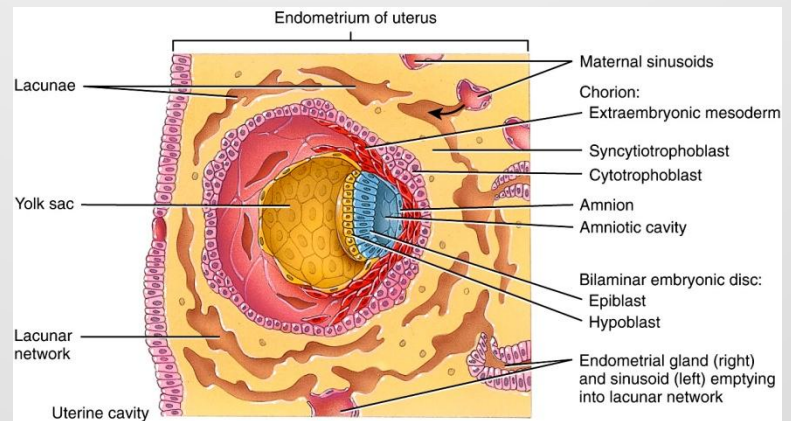
(a) Frontal section through endometrium of uterus showing blastocyst, about 8 days after fertilization

Figure 29.06a Tortora - PAP 12/e
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(b) Frontal section through endometrium of uterus showing blastocyst, about 9 days after fertilization

Figure 29.06b Tortora - PAP 12/e
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(c) Frontal section through endometrium of uterus showing blastocyst, about 12 days after fertilization

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D. Abnormalities:

1. Ectopic pregnancy:

- ovarian.
- Tubal.
- Abdominal.

2. Placenta previa:

- Lateralis.
- Marginalis.
- Centralis.

Second week of development

2. Development of trophoblast


- About 8 days after fertilization, trophoblast develops into 2 layers in region of contact between blastocyst and endometrium become part of chorion.
- Blastocyst becomes buried in endometrium and inner 1/3 of myometrium.
- Secretes human chorionic gonadotropin (hCG) that maintains corpus luteum so it continues to secrete estrogens and progesterone maintains uterine lining.

Second week of development (cont.)

3. Development of bilaminar embryonic disc

- Cells of embryoblast also differentiate into 2 layers around 8 days after fertilization
 - Hypoblast (primitive endoderm)
 - Epiblast (primitive ectoderm)
 - Small cavity enlarges to form amniotic cavity

4. Development of amnion

- Amnion forms roof of amniotic cavity and epiblast forms floor
 - Amnion eventually surrounds entire embryo
 - Amniotic cavity filled with amniotic fluid
 - Fluid derived from maternal blood and later fetal urine
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Second week of development (cont.)

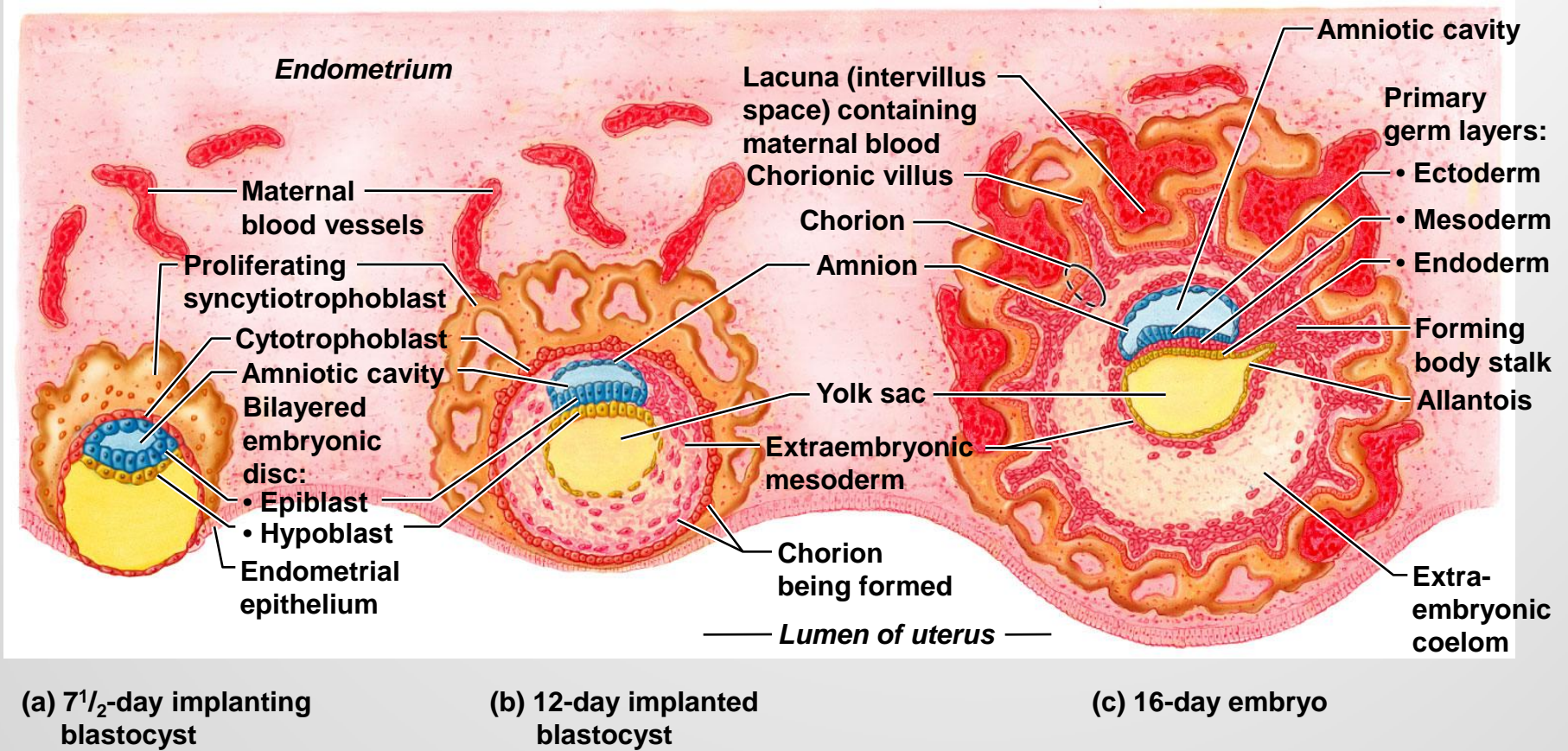
4. Development of yolk sac

- Also on 8th day after fertilization, cells at edge of hypoblast migrate to cover inner surface of blastocyst wall
- Form exocoelomic membrane
- Yolk sac – hypoblast and exocoelomic membrane
 - Relatively small and empty since nutrition derived from endometrium
 - Several important functions – supplies early nutrients, source of blood cells, contains primordial germ cells that migrate to gonads to form gametes, forms part of gut, functions as shock absorber, prevents desiccation

Second week of development (cont.)

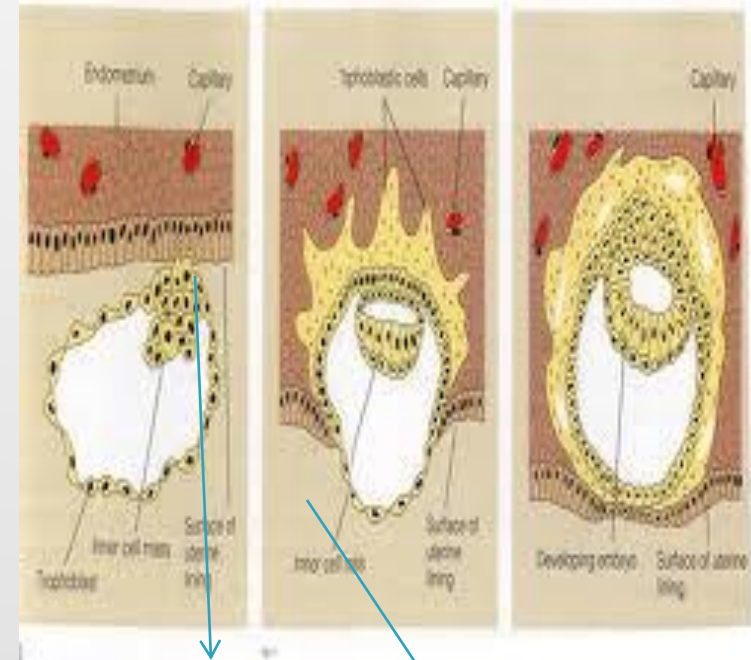
- Development of sinusoids
 - 9th day after fertilization, blastocyst completely embedded in endometrium
 - Syncytiotrophoblast expands and spaces (lacunae) develop
 - 12th day – lacunae fuse to form lacunar networks
 - Endometrial capillaries dilate to form maternal sinusoids
- Development of extraembryonic coelom - about 12th day after fertilization
 - Fuse to form single large cavity
- Development of chorion
 - Formed by extraembryonic mesoderm and 2 layers of trophoblast
 - Becomes principal embryonic part of placenta
 - Protect embryo from immune responses of mother
 - Produces hCG
 - Connecting (body) stalk connects bilaminar embryonic disc to trophoblast – will become umbilical cord

Events of placentation, early embryonic development, and extraembryonic membrane formation



1 – Further development of the Trophoblast

- ▶ The trophoblast differentiates into cytotrophoblast & syncytiotrophoblast.
- ▶ Cells of the cytotrophoblast divide and migrate externally.
- ▶ They lose their cell membranes to form the syncytiotrophoblast.
- ▶ The syncytiotrophoblast erodes the maternal tissues, so lacunae filled with maternal blood surround columns of syncytiotrophoblast.
- ▶ These columns of syncytiotrophoblast will form primary villi.



syncytiotrophoblast cytotrophoblast

2– (bilaminar germ disc)

The inner cell mass is differentiated into:

a- **Epiblast** = endoderm (small cuboidal cells facing the blastocyst cavity and

b- **Hypoblast**= ectoderm (tall columnar cells facing the amniotic cavity).

Both layers will form the bilaminar germ disc.

Cavities develop within the epiblast and coalesce to form the amniotic cavity.

-The epiblast (future ectoderm) will surround the amniotic cavity (amnioblast) so forming *the amniotic membrane*.

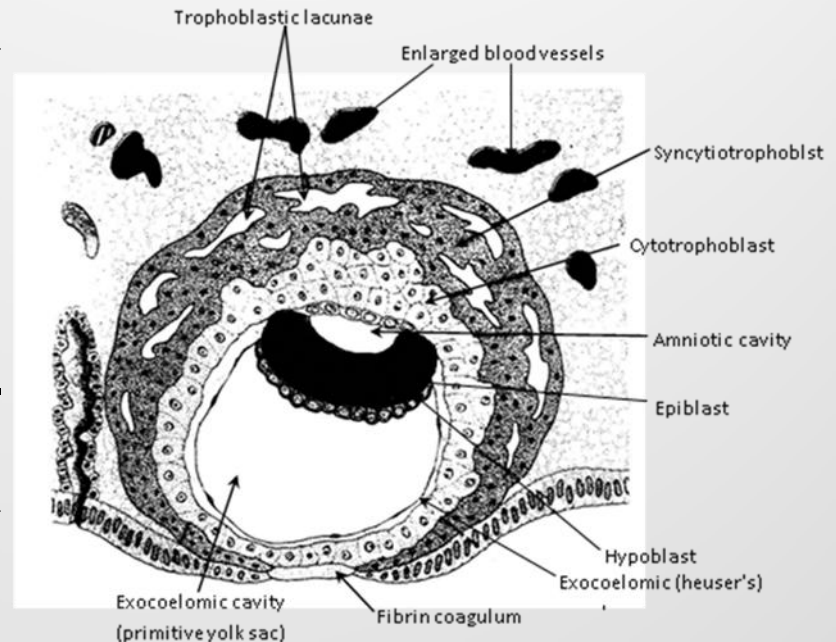


Fig. 34: Drawing of a 9 day human blastocyst.

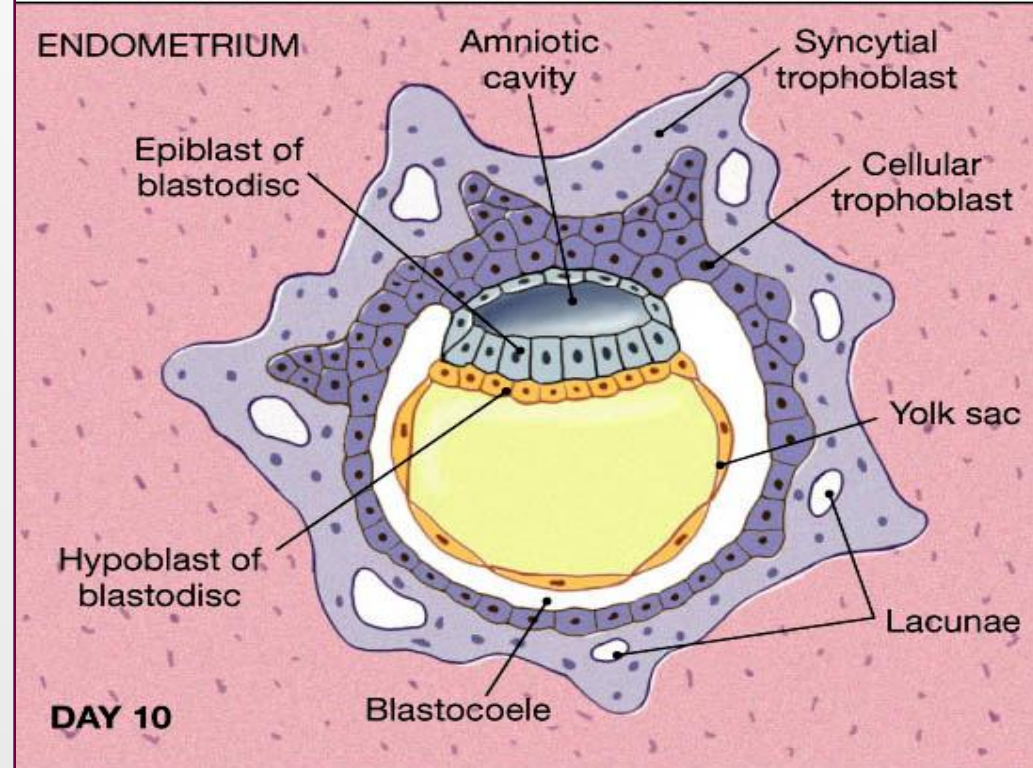
Day 10

**Embryo completely
embedded in
endometrium**

**Amnion and yolk sac
visible**

**Blastodisc formation
(2 cell layers)**

- Epiblast
- Hypoblast



- The hypoblast cells (future endoderm) migrate and line the inner surface of cytotrophoblast so forming the exocoelomic membrane (flat cell from the endoderm) which limits a space called the exocoelomic cavity (**primary or primitive yolk sac**).
- It is formed in the ventral aspect of the embryonic disc.

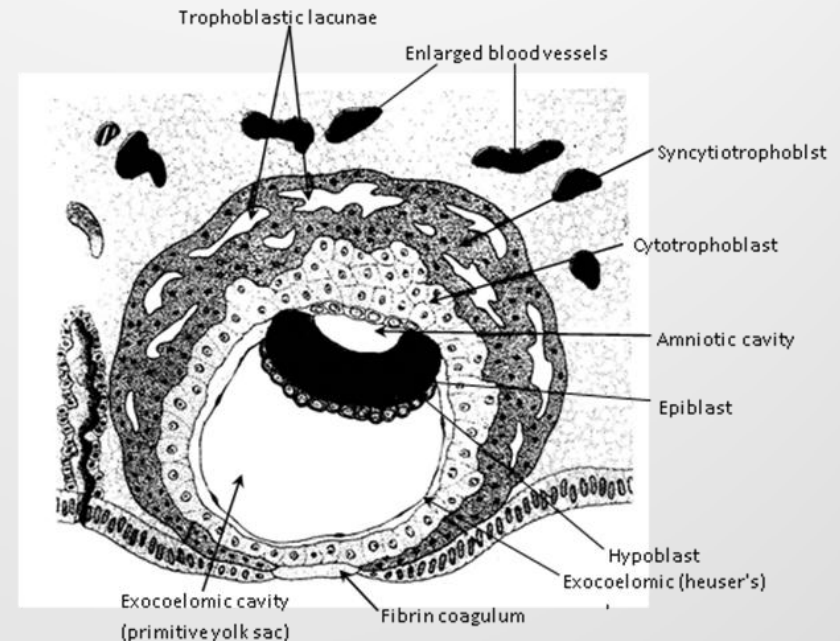


Fig. 34: Drawing of a 9 day human blastocyst.

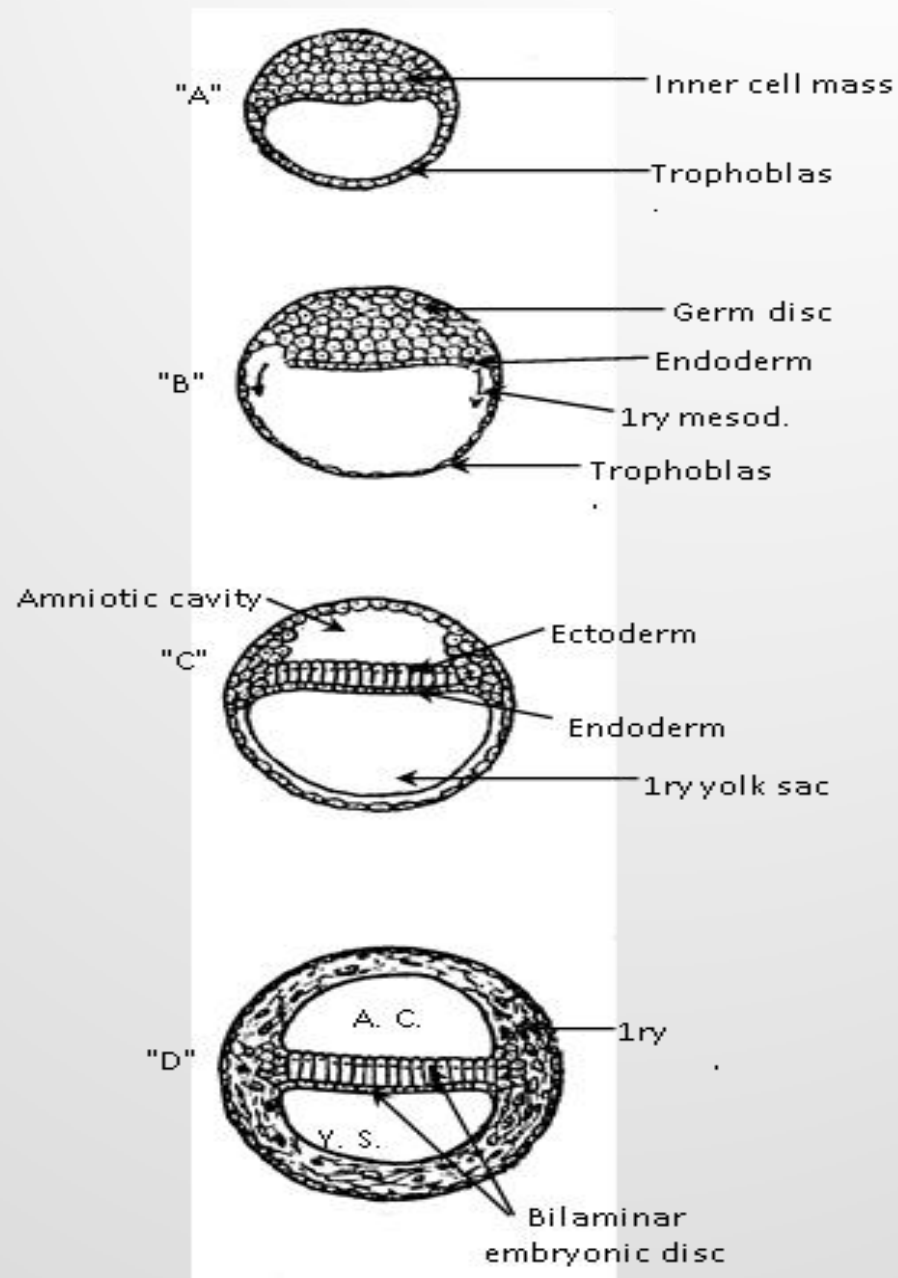
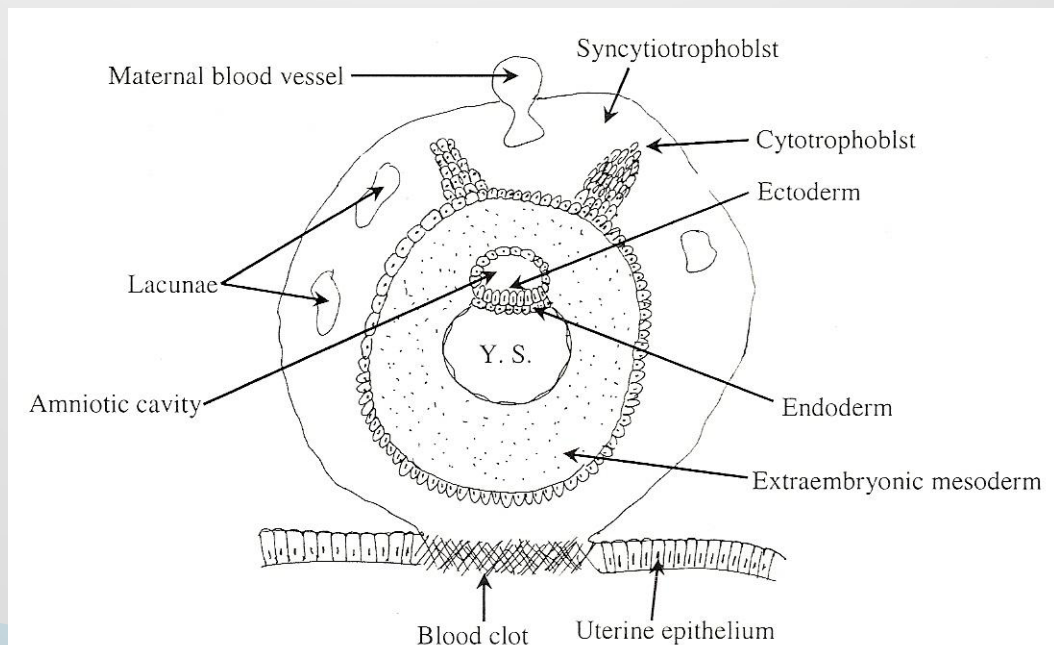


Fig. 36. Differentiation of the inner cell mass.

3- FORMATION OF THE EXTRA-EMBRYONIC MESODERM AND EXTRAEMBRYONIC COELOM

- Cells appear between the inner surface of the cytotrophoblasts and the outer surface of the yolk sac cavity
 - a. These cells are derived from the yolk sac cells and form the *extra-embryonic (primary) mesoderm*.
 - b. They fill the space between the trophoblasts, the amnion and yolk sac cavities.



Large spaces develop in the extraembryonic mesoderm and coalesce to form extraembryonic coelom. It surrounds the primitive yolk sac and amniotic cavity except where the germ disc is connected to the trophoblasts by the *connecting stalk* or *body stalk*

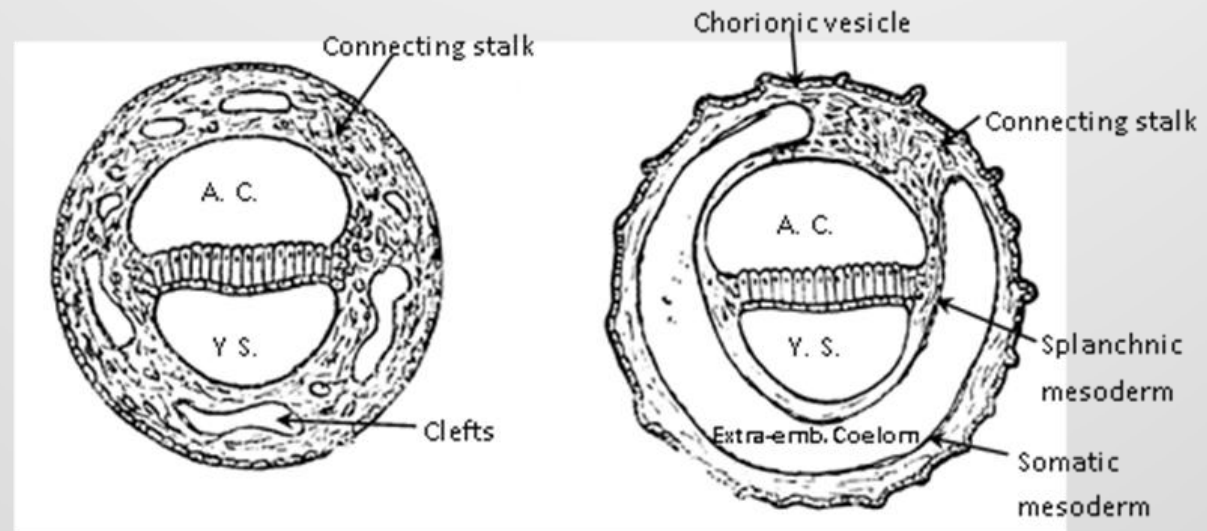


Fig. 36: Formation of the extra-embryonic coelom.

3- Development of Extraembryonic Mesoderm (cont)

-The extraembryonic coelom divides the extraembryonic mesoderm into the extraembryonic somatopleuric mesoderm (lines the trophoblast, and covers the amnion) and extraembryonic splanchnopleuric mesoderm (covers the yolk sac).

-Extraembryonic somatic mesoderm, cytotrophoblast, and syncytiotrophoblast constitute the chorion.

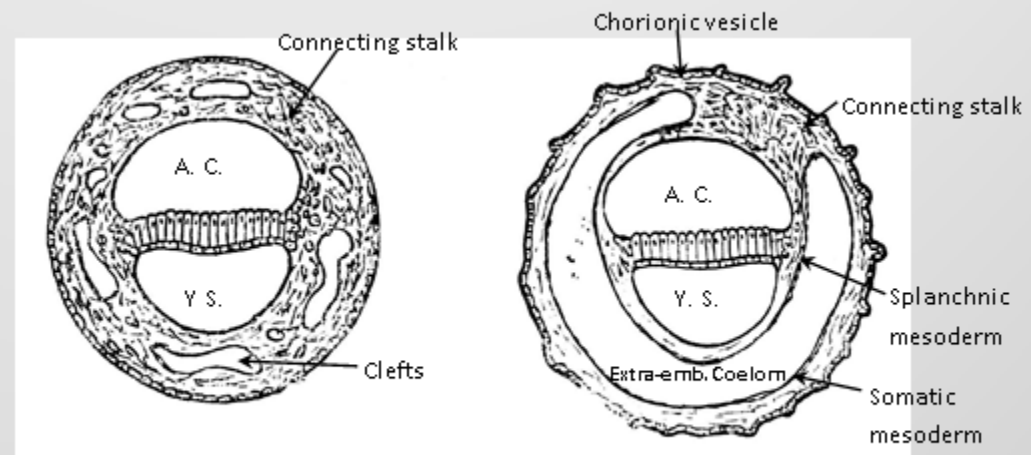



Fig. 36: Formation of the extra-embryonic coelom.

Clinical application:

- ▶ The syncytiotrophoblast secretes human chorionic gonadotrophin hormone which prevents the degeneration of the corpus luteum. It also stimulates the production of progesterone which in turn is important in sustaining the placenta. By the end of the 2nd week, the amount of this hormone will be sufficient to be detected in the maternal blood and urine. This is the basis of pregnancy test.

The second week of development is the week of twos, because of the following:

- ▶ The trophoblast differentiates into 2 layers, cytotrophoblast & syncytiotrophoblast
 - ▶ The inner cell mass differentiates into 2 layers, epiblast & hypoblast.
 - ▶ The primary mesoderm splits into somatopleuric primary mesoderm & splanchnopleuric primary mesoderm.
 - ▶ Starting of formation of the amniotic and yolk sac cavities.
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Thanks

